



SEQUENCE LISTING

<110> Tuomanen, Elaine I
Wizemann, Theresa M.
Masure, H. R.
Johnson, Leslie S.
Koenig, Scott

<120> POLYPEPTIDE COMPRISING THE AMINO ACID OF AN N-TERMINAL
CHOLINE BINDING PROTEIN A TRUNCATE, VACCINE DERIVED
THEREFROM AND USES THEREOF

<130> 044158/273011

<140> 10/751,702

<141> 2004-01-05

<150> 09/056,019

<151> 1998-04-07

<160> 42

<170> PatentIn Ver. 2.0

<210> 1

<211> 406

<212> PRT

<213> Streptococcus pneumoniae

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Arg	Asp	Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val
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Gly	Glu	Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val
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Ala	Leu	Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys
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Ile	Val	Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu
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Ser	Arg	Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser
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Ser	Ser	Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp
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Thr	Ala	Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu
	130					135					140				

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
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 Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
 165 170 175
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu
 180 185 190
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys
 195 200 205
 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu
 210 215 220
 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg
 225 230 235 240
 Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg
 245 250 255
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
 260 265 270
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser
 275 280 285
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 290 295 300
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 305 310 315 320
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 325 330 335
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 340 345 350
 Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu
 355 360 365
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 385 390 395 400
 Val Lys Glu Lys Pro Ala
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 <212> PRT
 <213> Streptococcus pneumoniae

<400> 2

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Arg	Asp	Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val	
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Gly	Glu	Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val	
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Ala	Leu	Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys	
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Ile	Val	Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu	
				85					90					95		
Ser	Arg	Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser	
			100					105						110		
Ser	Ser	Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp	
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Thr	Ala	Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu	
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Ala	Lys	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	
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Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	
				165					170					175		
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	
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Leu	Val	Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Glu	Gln	Lys	Ile	Lys	
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Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	
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Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	Glu	Ala	Lys	Arg	
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Arg	Ala	Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	
				245					250					255		
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	
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Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	
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Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	
	290					295					300					

Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	305	310	315	320
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	325	330	335	
Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	340	345	350	
Glu	Pro	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	355	360	365	
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	370	375	380	
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	385	390	395	400
Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Lys	405	410	415	
Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Asn	Pro	Ala	Glu	Gln	420	425	430	
Pro	Lys	Ala	Glu	Lys	Pro	Ala	Asp	Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	435	440	445	
Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	Thr	Gln	Gln	Gln	Pro	Pro	450	455	460	
Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Ser	Thr	Pro	Lys	Thr	Gly	Trp	Lys	465	470	475	480
Gln	Glu	Asn	Gly	Met	Trp	Tyr	Phe	Tyr	Asn	Thr	Asp	Gly	Ser	Met	Ala	485	490	495	
Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	500	505	510	
Gly	Ala	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	515	520	525	
Leu	Asn	Ala	Asn	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	530	535	540	
Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	545	550	555	560
Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Ser	Met	Ala	565	570	575	
Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	580	585	590	
Gly	Asp	Met	Ala	Thr	Gly	Trp	Val	Lys	Asp	Gly	Asp	Thr	Trp	Tyr	Tyr	595	600	605	

Leu Glu Ala Ser Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser
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Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly Ala Leu Ala Val Asn Thr
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<212> PRT

<213> Streptococcus pneumoniae

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20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser
100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp
115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu
130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu
180 185 190

Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys
195 200 205

Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu

210	215	220
Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg		
225	230	235 240
Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg		
	245	250 255
Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala		
	260	265 270
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu		
	275	280

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Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val
35 40 45
Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
50 55 60
Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser
65 70 75 80
Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys
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Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala
100 105

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 <213> Streptococcus pneumoniae

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20 25 30
Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
35 40 45

Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn
50 55 60

Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu
65 70 75 80

Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg
85 90 95

Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala
100 105

<210> 6
<211> 4
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<213> Streptococcus pneumoniae

<220>
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<223> They could be any amino acid at these two
locations.

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<210> 7
<211> 376
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<213> Streptococcus pneumoniae

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20 25 30

Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
35 40 45

Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
50 55 60

Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
65 70 75 80

Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
85 90 95

Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 115 120 125
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
 130 135 140
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 145 150 155 160
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
 165 170 175
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 180 185 190
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys
 195 200 205
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala
 210 215 220
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn
 225 230 235 240
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser
 245 250 255
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val
 260 265 270
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
 275 280 285
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu
 290 295 300
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 305 310 315 320
 Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys
 325 330 335
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr
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 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu
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 Asp Lys Val Lys Glu Lys Pro Ala
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<210> 8

<211> 663

<212> PRT

<213> Streptococcus pneumoniae

<400> 8

Glu	Asn	Glu	Gly	Ser	Thr	Gln	Ala	Ala	Thr	Ser	Ser	Asn	Met	Ala	Lys
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Thr	Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	Val	Asp	Glu	Tyr	Ile	Glu
			20					25					30		
Lys	Met	Leu	Arg	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn
		35					40					45			
Val	Ala	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Arg
	50					55					60				
Glu	Leu	Asn	Val	Leu	Glu	Glu	Lys	Ser	Lys	Asp	Glu	Leu	Pro	Ser	Glu
65					70					75					80
Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Lys	Phe	Lys	Lys	Asp	Thr
				85					90						95
Leu	Lys	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	Lys	Lys	Lys	Val	Glu	Glu
			100					105					110		
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
		115					120					125			
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Phe	Asp
	130					135					140				
Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys
145					150					155					160
Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu
			165						170					175	
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg
			180					185					190		
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Asp	Ala	Lys	Leu	Lys
		195					200					205			
Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala
	210					215					220				
Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn
225					230					235					240
Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser
			245						250					255	
Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val
		260						265					270		
Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg
		275					280					285			
Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp	Leu	Glu	Ile	Ala	Glu
	290					295					300				

Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	305	310	315	320
Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys	325	330	335	
Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	340	345	350	
Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	355	360	365	
Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	370	375	380	
Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	Glu	Lys	Pro	Ala	Glu	Gln	385	390	395	400
Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	405	410	415	
Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	Thr	Gln	Gln	Gln	Pro	Pro	420	425	430	
Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Ser	Thr	Pro	Lys	Thr	Gly	Trp	Lys	435	440	445	
Gln	Glu	Asn	Gly	Met	Trp	Tyr	Phe	Tyr	Asn	Thr	Asp	Gly	Ser	Met	Ala	450	455	460	
Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	465	470	475	480
Gly	Ala	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	485	490	495	
Leu	Asn	Ala	Asn	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	500	505	510	
Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Ala	Met	Ala	Thr	Gly	Trp	Leu	515	520	525	
Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	Ala	Met	Ala	530	535	540	
Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	545	550	555	560
Gly	Asp	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	565	570	575	
Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	580	585	590	
Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Val	595	600	605	

Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys
 610 615 620
 Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly
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 645 650 655
 Ala Asn Gly Glu Trp Val Asn
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<210> 9

<211> 254

<212> PRT

<213> Streptococcus pneumoniae

<400> 9

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 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
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 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
 35 40 45
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
 50 55 60
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
 65 70 75 80
 Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
 85 90 95
 Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
 100 105 110
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 115 120 125
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
 130 135 140
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 145 150 155 160
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
 165 170 175
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 180 185 190
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys

195	200	205
Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala		
210	215	220
Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn		
225	230	235 240
Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu		
	245	250

<210> 10
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 <212> PRT
 <213> Streptococcus pneumoniae

<400> 10
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Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Ser Asp Val
35 40 45
Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
50 55 60
Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser
65 70 75 80
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Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala
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 <212> PRT
 <213> Streptococcus pneumoniae

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20 25 30
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys
35 40 45
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser
50 55 60

Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser Lys
65 70 75 80

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85 90 95

Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala
100 105

<210> 12
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<212> DNA
<213> Streptococcus pneumoniae

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gaggaatatg taataaaaaat agtggtgag agctatgcaa aatcaactaa aaagcgacat 180
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360
tcactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420
aaggtagcag aagctaagaa gaaggttgaa gaagctgaga aaaaagccaa ggatcaaaaa 480
gaagaagatc gtcgtaacta cccaaccatt acttcaaaaa cgcttgaact tgaaattgct 540
gagtcgcatg tggaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600
cctcgagacg agcaaaaaat taagcaagca gaagcggag ttgagagtaa acaagctgag 660
gctacaaggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720
agagcagatg ctaagagca aggtaaacca aaggggcggg caaacgagg agttcctgga 780
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 840
gaagaaactc ttccaagccc atccctgaaa ccagaaaaaa aggtagcaga agctgagaag 900
aaggttgaag aagctaagaa aaaagccgag gatcaaaaaa agaagatcg ccgtaactac 960
ccaaccaata cttacaaaaa gcttgaactt gaaattgctg agtccgatgt ggaagttaaa 1020
aaagcggagc ttgaactagt aaaagaggaa gctaaggaac ctcgaaacga ggaaaaagtt 1080
aagcaagcaa aagcggaggt tgagagtaaa aaagctgagg ctacaagggt agaaaaaatc 1140
aagacagatc gtaaaaaagc agaagaagaa gctaaacgaa aagcagcaga agaagataaa 1200
gttaagaaa aaccagctg 1219

<210> 13
<211> 1969
<212> DNA
<213> Streptococcus pneumoniae

<400> 13
gagaacgagg gagctaccca agtaccact tcttctaata gggcaaataa aagtcaggca 60
gaacaaggag aacaacctaa aaaactcgat tcagaacgag ataaggcaag gaaagaggctc 120
gaggaatatg taataaaaaat agtggtgag agctatgcaa aatcaactaa aaagcgacat 180
acaattactg tagctctagt taacgagttg aacaacatta agaacgagta tttgaataaa 240
atagttgaat caacctcaga aagccaacta cagatactga tgatggagag tcgatcaaaa 300
gtagatgaag ctgtgtctaa gtttgaaaag gactcatctt cttcgtcaag ttcagactct 360
tcactaaac cggaagcttc agatacagcg aagccaaaca agccgacaga accaggagaa 420
aaggtagcag aagctaagaa gaaggttgaa gaagctgaga aaaaagccaa ggatcaaaaa 480
gaagaagatc gtcgtaacta cccaaccatt acttcaaaaa cgcttgaact tgaaattgct 540
gagtcgcatg tggaagttaa aaaagcggag cttgaactag taaaagttaa agctaacgaa 600
cctcgagacg agcaaaaaat taagcaagca gaagcggag ttgagagtaa acaagctgag 660
gctacaaggt taataaaaaat caagacagat cgtgaagaag cagaagaaga agctaaacga 720

agagcagatg	ctaaagagca	aggtaaacca	aaggggcggg	caaaacgagg	agttcctgga	780
gagctagcaa	cacctgataa	aaaagaaaaat	gatgcgaagt	cttcagattc	tagcgtaggt	840
gaagaaactc	ttccaagccc	atccctgaaa	ccagaaaaaa	aggtagcaga	agctgagaag	900
aaggttgaag	aagctaagaa	aaaagccgag	gatcaaaaag	aagaagatcg	ccgtaactac	960
ccaaccaata	cttacaaaac	gcttgaactt	gaaattgctg	agtccgatgt	ggaagttaaa	1020
aaagcggagg	cttgaactag	taaaagagga	agctaaggaa	cctcgaaacg	aggaaaaagt	1080
taagcaagca	aaagcggaa	ttgagagtaa	aaaagctgag	gctacaaggt	tagaaaaaat	1140
caagacagat	cgtaaaaaag	cagaagaaga	agctaaacga	aaagcagcag	aagaagataa	1200
agttaaagaa	aaaccagctg	aacaaccaca	accagcgccg	gctccaaaag	cagaaaaacc	1260
agctccagct	ccaaaaccag	agaatccagc	tgaacaacca	aaagcagaaa	aaccagctga	1320
tcaacaagct	gaagaagact	atgctcgtag	atcagaagaa	gaatataatc	gcttgactca	1380
acagcaaccg	ccaaaaactg	aaaaaccagc	acaaccatct	actccaaaaa	caggctggaa	1440
acaagaaaac	ggtatgtggt	acttctacaa	tactgatggt	tcaatggcga	caggatggct	1500
ccaaaacaat	ggctcatggt	actacctcaa	cagcaatggc	gctatggcga	caggatggct	1560
ccaaaacaat	ggttcatggt	actatctaaa	cgctaattggt	tcaatggcaa	caggatggct	1620
ccaaaacaat	ggttcatggt	actacctaaa	cgctaattggt	tcaatggcga	caggatggct	1680
ccaatacaat	ggctcatggt	actacctaaa	cgctaattggt	tcaatggcga	caggatggct	1740
ccaatacaat	ggctcatggt	actacctaaa	cgctaattggt	gatatggcga	cagggtgggt	1800
gaaagatgga	gatacctggt	actatcttga	agcatcaggt	gctatgaaag	caagccaatg	1860
gttcaaagta	tcagataaat	ggtactatgt	caatggctca	ggtgcccttg	cagtcaacac	1920
aactgtagat	ggctatggag	tcaatgccaa	tggtgaatgg	gtaaactaa		1969

<210> 14

<211> 853

<212> DNA

<213> Streptococcus pneumoniae

<400> 14

gagaacgagg	gagctaccca	agtaccact	tcttctaata	gggcaaata	aagtcaggca	60
gaacaaggag	aacaacctaa	aaaactcgat	tcagaacgag	ataaggcaag	gaaagaggct	120
gaggaatatg	taaaaaaaat	agtgggtgag	agctatgcaa	aatcaactaa	aaagcgacat	180
acaattactg	tagctctagt	taacgagttg	aacaacatta	agaacgagta	tttgaataaa	240
atagttgaag	caacctcaga	aagccaacta	cagatactga	tgatggagag	tcgatcaaaa	300
gtagatgaag	ctgtgtctaa	gtttgaaaag	gactcatctt	cttcgtcaag	ttcagactct	360
tccactaaac	cggaagcttc	agatacagcg	aagccaaaca	agccgacaga	accaggagaa	420
aaggtagcag	aagctaagaa	gaaggttgaa	gaagctgaga	aaaaagccaa	ggatcaaaaa	480
gaagaagatc	gtcgtactaa	cccaaccatt	acttacaaaa	cgcttgaact	tgaaattgct	540
gagtcggatg	tggaagttaa	aaaagcggag	cttgaactag	taaaagttaa	agctaacgaa	600
cctcgagacg	agcaaaaaat	taagcaagca	gaagcggaa	ttgagagtaa	acaagctgag	660
gctacaaggt	taaaaaaaat	caagacagat	cgtgaagaag	cagaagaaga	agctaaacga	720
agagcagatg	ctaaagagca	aggtaaacca	aaggggcggg	caaaacgagg	agttcctgga	780
gagctagcaa	cacctgataa	aaaagaaaaat	gatgcgaagt	cttcagattc	tagcgtaggt	840
gaagaaactc	ttc					853

<210> 15

<211> 318

<212> DNA

<213> Streptococcus pneumoniae

<400> 15

aaaccagaaa	aaaaggtagc	agaagctgag	aagaaggttg	aagaagctaa	gaaaaaagcc	60
gaggatcaaa	aagaagaaga	tcgccgtaac	tacccaacca	atacttacaa	aacgcttgaa	120
cttgaaattg	ctgagtcgga	tgtggaagtt	aaaaaagcgg	agcttgaact	agtaaaagag	180
gaagctaagg	aacctcgaaa	cgaggaaaaa	gttaagcaag	caaaagcggg	agttgagagt	240
aaaaaagctg	aggctacaag	gttagaaaaa	atcaagacag	atcgtaaaaa	agcagaagaa	300
gaagctaaac	gaaaagca					318

<210> 16
 <211> 327
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 16
 acagaaccag gagaaaaggt agcagaagct aagaagaagg ttgaagaagc tgagaaaaaa 60
 gccaaggatc aaaaagaaga agatcgctcg aactacccaa ccattactta caaaacgctt 120
 gaacttgaaa ttgctgagtc cgatgtggaa gttaaaaaag cggagcttga actagtaaaa 180
 gtgaaagcta acgaacctcg agacgagcaa aaaattaagc aagcagaagc ggaagttgag 240
 agtaacaag ctgaggctac aaggttaaaa aaaatcaaga cagatcgtga agaagcagaa 300
 gaagaagcta aacgaagagc agatgct 327

<210> 17
 <211> 1129
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 17
 gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
 aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgaggga gattcaacta 120
 gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
 aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
 ataaaagcaa agtttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
 gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
 aaagaagaag atcgctcgtaa ctacccaacc aatacttaca aaacgcttga acttgaaatt 420
 gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
 gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
 gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
 cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
 aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720
 gatgcgaagt cttcagattc tagcgtaggt gaagaaactc ttccaagctc atccctgaaa 780
 tcaggaaaaa aggtgagaa agctgagaag aaggttgaag aagctgagaa aaaagccaag 840
 gatcaaaaag aagaagatcg ccgtaactac ccaaccaata cttacaaaac gcttgacctt 900
 gaaattgctg agtccgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 960
 gctaaggaac ctcgagacga ggaaaaaatt aagcaagcaa aagcgaaagt tgagagtaaa 1020
 aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 1080
 gctaaacgaa aagcagcaga agaagataaa gttaaagaaa aaccagctg 1129

<210> 18
 <211> 1992
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 18
 gaaaacgaag gaagtaccca agcagccact tcttctaata tggcaaagac agaacatagg 60
 aaagctgcta aacaagtcgt cgatgaatat atagaaaaaa tgttgaggga gattcaacta 120
 gatagaagaa aacataccca aaatgtcgcc ttaaacataa agttgagcgc aattaaaacg 180
 aagtatttgc gtgaattaaa tgttttagaa gagaagtcga aagatgagtt gccgtcagaa 240
 ataaaagcaa agtttagacgc agcttttgag aagtttaaaa aagatacatt gaaaccagga 300
 gaaaaggtag cagaagctaa gaagaagggt gaagaagcta agaaaaaagc cgaggatcaa 360
 aaagaagaag atcgctcgtaa ctacccaacc aatacttaca aaacgcttga acttgaaatt 420
 gctgagttcg atgtgaaagt taaagaagcg gagcttgaac tagtaaaaga ggaagctaaa 480
 gaatctcgaa acgagggcac aattaagcaa gcaaaagaga aagttgagag taaaaaagct 540
 gaggctacaa ggtagaaaa catcaagaca gatcgtaaaa aagcagaaga agaagctaaa 600
 cgaaaagcag atgctaagtt gaaggaagct aatgtagcga cttcagatca aggtaaacca 660
 aaggggcggg caaaacgagg agttcctgga gagctagcaa cacctgataa aaaagaaaat 720

gatgcgaagt	cttcagattc	tagcgtaggt	gaagaaactc	ttccaagctc	atccctgaaa	780
tcaggaaaaa	aggtagcaga	agctgagaag	aaggttgaag	aagctgagaa	aaaagccaag	840
gatcaaaaag	aagaagatcg	ccgtaactac	ccaaccaata	cttacaaaac	gcttgacctt	900
gaaattgctg	agtccgatgt	gaaagttaaa	gaagcggagc	ttgaactagt	aaaagaggaa	960
gctaaggaac	ctcgagacga	ggaaaaaatt	aagcaagcaa	aagcgaaagt	tgagagtaaa	1020
aaagctgagg	ctacaagggtt	agaaaacatc	aagacagatc	gtaaaaaagc	agaagaagaa	1080
gctaaacgaa	aagcagcaga	agaagataaa	gttaaagaaa	aaccagctga	acaaccacaa	1140
ccagcgccgg	ctactcaacc	agaaaaacca	gctccaaaac	cagagaagcc	agctgaacaa	1200
ccaaaagcag	aaaaaacaga	tgatcaacaa	gctgaagaag	actatgctcg	tagatcagaa	1260
gaagaatata	atcgcttgac	tcaacagcaa	ccgccaaaaa	ctgaaaaacc	agcacaacca	1320
tctactccaa	aaacaggctg	gaaacaagaa	aacggtatgt	ggtacttcta	caatactgat	1380
ggttcaatgg	caacaggatg	gctccaaaac	aacggttcat	ggtactatct	aaacgctaata	1440
ggtgctatgg	cgacaggatg	gctccaaaac	aatgggttcat	ggtactatct	aaacgctaata	1500
ggttcaatgg	caacaggatg	gctccaaaac	aatgggttcat	ggtactacct	aaacgctaata	1560
ggtgctatgg	cgacaggatg	gctccaatac	aatgggttcat	ggtactacct	aaacagcaat	1620
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ggtgatatgg	cgacaggatg	ggtgaaagat	ggagataacct	ggtactatct	tgaagcatca	1860
ggtgctatga	aagcaagcca	atgggttcaaa	gtatcagata	aatgggtacta	tgtcaatggc	1920
tcaggtgcc	ttgcagtcaa	cacaactgta	gatggctatg	gagtcaatgc	caatgggtgaa	1980
tgggtaaact	aa					1992

<210> 19

<211> 763

<212> DNA

<213> Streptococcus pneumoniae

<400> 19

gaaaacgaag	gaagtaccca	agcagccact	tcttctaata	tggcaaagac	agaacatagg	60
aaagctgcta	aacaagtcgt	cgatgaatat	atagaaaaaa	tggtgaggga	gattcaacta	120
gatagaagaa	aacataccca	aatgtcgcc	ttaaacataa	agttgagcgc	aattaaaacg	180
aagtatttgc	gtgaattaaa	tgtttttagaa	gagaagtcga	aagatgagtt	gccgtcagaa	240
ataaaagcaa	agtttagacgc	agcttttgag	aagtttaaaa	aagatacatt	gaaaccagga	300
gaaaaggtag	cagaagctaa	gaagaagggt	gaagaagcta	agaaaaaagc	cgaggatcaa	360
aaagaagaag	atcgctcgtaa	ctacccaacc	aatacttaca	aaacgcttga	acttgaaatt	420
gctgagttcg	atgtgaaagt	taaagaagcg	gagcttgaac	tagtaaaaga	ggaagctaaa	480
gaatctcgaa	acgagggcac	aattaagcaa	gcaaaagaga	aagttgagag	taaaaaagct	540
gaggctacaa	ggttagaaaa	catcaagaca	gatcgtaaaa	aagcagaaga	agaagctaaa	600
cgaaaagcag	atgctaagtt	gaaggaagct	aatgtagcga	cttcagatca	aggtaaacca	660
aaggggagg	caaaacgagg	agttcctgga	gagctagcaa	cacctgataa	aaaagaaaat	720
gatgcgaagt	cttcagattc	tagcgtaggt	gaagaaactc	ttc		763

<210> 20

<211> 318

<212> DNA

<213> Streptococcus pneumoniae

<400> 20

aaatcaggaa	aaaaggtagc	agaagctgag	aagaagggtt	aagaagctga	gaaaaaagcc	60
aaggatcaaa	aagaagaaga	tcgccgtaac	tacccaacca	atacttacaa	aacgcttgac	120
cttgaaattg	ctgagtcgga	tgtgaaagtt	aaagaagcgg	agcttgaact	agtaaaagag	180
gaagctaagg	aacctcgaga	cgaggaaaaa	attaagcaag	caaaagcgaa	agttgagagt	240
aaaaaagctg	aggctacaag	gtagaaaaac	atcaagacag	atcgtaaaaa	agcagaagaa	300
gaagctaaac	gaaaagca					318

<210> 21

<211> 321
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 21
 ccaggagaaa aggtagcaga agctaagaag aaggttgaag aagctaagaa aaaagccgag 60
 gatcaaaaag aagaagatcg tcgtaactac ccaaccaata cttacaaaac gcttgaactt 120
 gaaattgctg agttcgatgt gaaagttaaa gaagcggagc ttgaactagt aaaagaggaa 180
 gctaaagaat ctcgaaacga gggcacaatt aagcaagcaa aagagaaagt tgagagtaaa 240
 aaagctgagg ctacaagggt agaaaacatc aagacagatc gtaaaaaagc agaagaagaa 300
 gctaaacgaa aagcagatgc t 321

<210> 22
 <211> 121
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 22
 Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys
 1 5 10 15
 Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg
 20 25 30
 Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala
 35 40 45
 Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu
 50 55 60
 Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala
 65 70 75 80
 Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys
 85 90 95
 Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu
 100 105 110
 Glu Asp Lys Val Lys Glu Lys Pro Ala
 115 120

<210> 23
 <211> 122
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 23
 Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys
 1 5 10 15
 Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
 20 25 30
 Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile
 35 40 45

Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys
50 55 60

Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys
65 70 75 80

Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile
85 90 95

Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala
100 105 110

Glu Glu Asp Lys Val Lys Glu Lys Arg Ala
115 120

<210> 24
<211> 428
<212> PRT
<213> Streptococcus pneumoniae

<400> 24
Glu Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn
1 5 10 15

Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu
20 25 30

Arg Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val
35 40 45

Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val
50 55 60

Ala Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys
65 70 75 80

Ile Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu
85 90 95

Ser Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser
100 105 110

Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp
115 120 125

Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu
130 135 140

Ala Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
145 150 155 160

Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
165 170 175

Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu

180					185					190					
Leu	Val	Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Glu	Gln	Lys	Ile	Lys
	195					200					205				
Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu
	210					215					220				
Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	Glu	Ala	Lys	Arg
	225					230					235				240
Arg	Ala	Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg
				245					250					255	
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala
			260					265					270		
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser
			275				280					285			
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu
	290					295					300				
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
	305					310					315				320
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp
				325					330					335	
Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys
			340					345					350		
Glu	Pro	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu
		355					360					365			
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg
	370					375					380				
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys
	385					390					395				400
Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Lys
				405					410					415	
Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Asn				
			420					425							

<210> 25
 <211> 23
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 25
 ggcggatcca tggaraayga rgg

23

<210> 26

<211> 33
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 26
 gccgtcgact tagtttaccc attcaccatt ggc

33

<210> 27
 <211> 5
 <212> PRT
 <213> Streptococcus pneumoniae

<220>
 <221> VARIANT
 <222> (1)
 <223> It could be any amino acid.

<400> 27
 Xaa Glu Asn Glu Gly
 1 5

<210> 28
 <211> 439
 <212> PRT
 <213> Streptococcus pneumoniae

<220>
 <221> VARIANT
 <222> (243)
 <223> It could be any amino acid.

<400> 28
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 1 5 10 15
 Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser
 20 25 30
 Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys
 35 40 45
 Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu
 50 55 60
 Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser
 65 70 75 80
 Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala
 85 90 95
 Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr
 100 105 110
 Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 115 120 125

Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro
 130 135 140
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val
 145 150 155 160
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 165 170 175
 Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn
 180 185 190
 Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu
 195 200 205
 Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala
 210 215 220
 Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg
 225 230 235 240
 Glu Val Xaa Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
 245 250 255
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser
 260 265 270
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 275 280 285
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 290 295 300
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 305 310 315 320
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 325 330 335
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu
 340 345 350
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 355 360 365
 Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp
 370 375 380
 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro
 385 390 395 400
 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
 405 410 415
 Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro
 420 425 430

Ala Asp Gln Gln Ala Glu Glu
435

<210> 29

<211> 437

<212> PRT

<213> Streptococcus pneumoniae

<400> 29

Ala Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys
1 5 10 15

Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Lys Ser
20 25 30

Gln Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys
35 40 45

Lys Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu
50 55 60

Leu Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser
65 70 75 80

Val Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala
85 90 95

Lys Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr
100 105 110

Glu Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
115 120 125

Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro
130 135 140

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val
145 150 155 160

Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
165 170 175

Ser Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn
180 185 190

Lys Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu
195 200 205

Lys Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala
210 215 220

Asn Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg
225 230 235 240

Glu Val Leu Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
245 250 255

Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser
 260 265 270
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 275 280 285
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 290 295 300
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 305 310 315 320
 Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 325 330 335
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu
 340 345 350
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 355 360 365
 Lys Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp
 370 375 380
 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro
 385 390 395 400
 Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro
 405 410 415
 Ala Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro
 420 425 430
 Ala Asp Gln Gln Ala
 435

<210> 30
 <211> 439
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 30
 Val Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu
 1 5 10 15
 Lys Glu Val Thr Thr Gln Val Ala Thr Ser Ser Asn Arg Ala Asn Glu
 20 25 30
 Ser Gln Ala Gly His Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile
 35 40 45
 Lys Thr Met Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Phe Ala
 50 55 60
 Leu Asn Ile Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Arg Lys Leu

65	70					75					80				
Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Pro Ser Glu Thr Lys	85					90					95				
Lys Glu Ile Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Asn Arg	100					105					110				
Thr Lys Lys Thr Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys	115					120					125				
Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr	130					135					140				
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu	145					150					155				
Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser	165					170					175				
Arg Asp Asp Glu Lys Ile Lys Gln Ala Glu Ala Lys Val Glu Ser Lys	180					185					190				
Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys	195					200					205				
Ala Glu Glu Glu Ala Lys Arg Arg Ala Glu Ala Lys Leu Lys Glu Ala	210					215					220				
Val Glu Lys Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Gly Arg	225					230					235				
Arg Lys Arg Gly Val Pro Gly Glu Gln Ala Thr Pro Asp Lys Lys Glu	245					250					255				
Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Ala Leu Pro	260					265					270				
Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys	275					280					285				
Val Ala Glu Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Arg	290					295					300				
Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala	305					310					315				
Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu	325					330					335				
Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Asn Gln Ala Lys Ala	340					345					350				
Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys	355					360					365				
Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu															

370		375		380
Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro				
385		390		400
Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro				
	405		410	415
Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr				
	420		425	430
Asp Asp Gln Gln Ala Glu Glu				
	435			
<210> 31				
<211> 419				
<212> PRT				
<213> Streptococcus pneumoniae				
<400> 31				
Ala Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu Asn				
1	5		10	15
Glu Gly Thr Thr Gln Ala Pro Thr Ser Ser Asn Arg Gly Asn Glu Ser				
	20		25	30
Gln Ala Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Glu				
	35		40	45
Lys Met Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu				
	50		55	60
Leu Thr Lys Leu Gly Ala Ile Lys Thr Glu Tyr Leu Arg Gly Leu Ser				
	65		70	75
Val Ser Lys Glu Lys Ser Thr Ala Glu Leu Pro Ser Glu Ile Lys Glu				
	85		90	95
Lys Leu Thr Ala Ala Phe Lys Gln Phe Lys Lys Asp Thr Leu Lys Pro				
	100		105	110
Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Ala Glu Ala Lys Lys				
	115		120	125
Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile				
	130		135	140
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val				
	145		150	155
Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg				
	165		170	175
Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Lys				
	180		185	190

Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Lys Ala
 195 200 205
 Glu Glu Glu Ala Lys Arg Arg Val Asp Ala Lys Glu Gln Asp Glu Ser
 210 215 220
 Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Val Gly Glu Gln
 225 230 235 240
 Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser
 245 250 255
 Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly Lys Lys
 260 265 270
 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp Lys Lys Ala Lys
 275 280 285
 Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys
 290 295 300
 Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala
 305 310 315 320
 Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu
 325 330 335
 Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala
 340 345 350
 Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu
 355 360 365
 Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala
 370 375 380
 Glu Gln Pro Lys Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Ala Pro
 385 390 395 400
 Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp
 405 410 415
 Gln Gln Ala

<210> 32
 <211> 437
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 32
 Val Ala Ser Leu Phe Met Gly Ser Val Val His Ala Thr Glu Lys Glu
 1 5 10 15
 Val Thr Thr Gln Val Ala Thr Ser Ser Asn Lys Ala Asn Lys Ser Gln
 20 25 30

Thr Glu His Met Lys Ala Ala Lys Gln Val Asp Glu Tyr Ile Lys Lys
 35 40 45
 Lys Leu Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val Gly Leu Leu
 50 55 60
 Thr Lys Leu Gly Val Ile Lys Thr Glu Tyr Leu His Gly Leu Ser Val
 65 70 75 80
 Ser Lys Lys Lys Ser Glu Ala Glu Leu Pro Ser Glu Ile Lys Ala Lys
 85 90 95
 Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu
 100 105 110
 Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Lys
 115 120 125
 Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Leu Arg Asn Tyr Pro Thr
 130 135 140
 Asn Thr Tyr Lys Thr Leu Glu Leu Asp Ile Ala Glu Ser Asp Val Glu
 145 150 155 160
 Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser
 165 170 175
 Arg Asp Glu Lys Lys Ile Asn Gln Ala Lys Ala Lys Val Glu Asn Lys
 180 185 190
 Lys Ala Glu Ala Thr Arg Leu Lys Asn Ile Lys Thr Asp Arg Glu Lys
 195 200 205
 Ala Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Leu Gln Glu Ala Asn
 210 215 220
 Val Ala Thr Ser Glu Gln Asp Lys Ser Lys Arg Arg Ala Lys Arg Glu
 225 230 235 240
 Val Phe Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys
 245 250 255
 Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Thr Ser Pro Ser Leu
 260 265 270
 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 275 280 285
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
 290 295 300
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val
 305 310 315 320
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 325 330 335

Ser Arg Asn Glu Glu Lys Ile Lys Gln Val Lys Ala Lys Val Glu Ser
 340 345 350
 Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys
 355 360 365
 Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu Asp Lys
 370 375 380
 Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln
 385 390 395 400
 Pro Glu Lys Pro Thr Glu Glu Pro Glu Asn Pro Ala Pro Ala Pro Ala
 405 410 415
 Pro Lys Pro Glu Asn Pro Ala Glu Lys Pro Lys Ala Glu Lys Pro Ala
 420 425 430
 Asp Gln Gln Ala Glu
 435

<210> 33
 <211> 433
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 33
 Cys Thr Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu
 1 5 10 15
 Asn Glu Arg Thr Thr Gln Val Pro Thr Ser Ser Asn Arg Gly Lys Pro
 20 25 30
 Glu Arg Arg Lys Ala Ala Glu Gln Phe Asp Glu Tyr Ile Asn Lys Met
 35 40 45
 Ile Gln Leu Asp Lys Arg Lys His Thr Gln Asn Leu Ala Phe Asn Ile
 50 55 60
 Gln Leu Ser Arg Ile Lys Thr Glu Tyr Leu Asn Gly Leu Lys Glu Lys
 65 70 75 80
 Ser Glu Ala Glu Leu Pro Ser Lys Ile Lys Ala Glu Leu Asp Ala Ala
 85 90 95
 Phe Lys Gln Phe Lys Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys
 100 105 110
 Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Val Ala
 115 120 125
 Glu Ala Lys Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp His Arg Asn
 130 135 140
 Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu Phe

145		150		155		160
Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala						
		165		170		175
Asp Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val						
		180		185		190
Glu Ser Glu Lys Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp						
		195		200		205
Arg Glu Lys Ala Glu Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys						
		210		215		220
Glu Gln Asp Glu Ser Lys Arg Arg Lys Ser Arg Gly Lys Arg Gly Ala						
		225		230		235
Leu Gly Glu Gln Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser						
		245		250		255
Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys						
		260		265		270
Pro Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala Asp						
		275		280		285
Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr						
		290		295		300
Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys						
		305		310		315
Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu Ser						
		325		330		335
Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys						
		340		345		350
Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys						
		355		360		365
Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val Lys						
		370		375		380
Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu						
		385		390		395
Lys Pro Ala Glu Glu Pro Glu Asn Pro Val Pro Ala Pro Lys Pro Glu						
		405		410		415
Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala						
		420		425		430
Glu						

<210> 34
 <211> 427
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 34

Val	Ala	Val	Ala	Ser	Leu	Val	Met	Gly	Ser	Val	Val	His	Ala	Thr	Glu
1				5					10					15	
Lys	Glu	Val	Thr	Thr	Gln	Val	Pro	Thr	Tyr	Ser	Asn	Met	Ala	Lys	Thr
			20					25					30		
Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	Val	Asp	Glu	Tyr	Ile	Glu	Lys
		35					40					45			
Met	Leu	Arg	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Phe
	50					55					60				
Ala	Phe	Asn	Met	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Glu	Tyr	Leu	Tyr	Gly
65					70					75					80
Leu	Lys	Glu	Lys	Ser	Glu	Ala	Glu	Leu	Pro	Ser	Glu	Val	Lys	Ala	Lys
				85					90					95	
Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Leu	Gly
		100						105					110		
Glu	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys
		115					120					125			
Ala	Lys	Ala	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr
	130					135					140				
Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys
145					150					155					160
Lys	Ala	Glu	Leu	Glu	Leu	Leu	Lys	Glu	Glu	Ala	Lys	Thr	Arg	Asn	Glu
			165						170					175	
Asp	Thr	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu
		180						185					190		
Ala	Thr	Lys	Leu	Glu	Glu	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu
	195						200					205			
Glu	Ala	Lys	Arg	Lys	Ala	Glu	Ala	Glu	Glu	Asp	Lys	Val	Lys	Asp	Lys
	210					215					220				
Leu	Lys	Arg	Arg	Thr	Lys	Arg	Ala	Val	Pro	Gly	Glu	Pro	Ala	Thr	Pro
225					230					235					240
Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu
				245					250					255	
Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu
		260						265					270		

Ala Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys
 275 280 285
 Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp
 290 295 300
 Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu
 305 310 315 320
 Leu Val Lys Glu Glu Ala Lys Gly Ser Arg Asn Glu Glu Lys Ile Asn
 325 330 335
 Gln Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu
 340 345 350
 Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg
 355 360 365
 Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro
 370 375 380
 Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu
 385 390 395 400
 Asn Pro Ala Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro Lys
 405 410 415
 Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu
 420 425

<210> 35
 <211> 413
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 35
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
 1 5 10 15
 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
 20 25 30
 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
 35 40 45
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
 50 55 60
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu
 65 70 75 80
 Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr
 85 90 95
 Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
 100 105 110

Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 115 120 125
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp
 130 135 140
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys
 145 150 155 160
 Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu
 165 170 175
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 180 185 190
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys
 195 200 205
 Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala
 210 215 220
 Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn
 225 230 235 240
 Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser
 245 250 255
 Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val
 260 265 270
 Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg
 275 280 285
 Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu
 290 295 300
 Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu
 305 310 315 320
 Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys
 325 330 335
 Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr
 340 345 350
 Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu
 355 360 365
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala
 370 375 380
 Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln
 385 390 395 400
 Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu
 405 410

<210> 36
 <211> 425
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 36
 Tyr Ile Ala Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val
 1 5 10 15
 Arg Ser Glu Asn Asn Pro Thr Val Thr Ser Ser Gly Gln Asp Ile Ser
 20 25 30
 Lys Lys Tyr Ala Asp Glu Val Lys Ser His Leu Glu Lys Ile Leu Ser
 35 40 45
 Glu Ile Gln Thr Asn Leu Asp Arg Ser Lys His Ile Lys Thr Val Asn
 50 55 60
 Leu Ile Asn Lys Leu Gln Asp Ile Lys Arg Thr Tyr Leu Tyr Glu Leu
 65 70 75 80
 Asn Val Leu Glu Asp Lys Ser Lys Ala Glu Leu Pro Ser Lys Ile Lys
 85 90 95
 Ala Glu Leu Asp Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro
 100 105 110
 Thr Glu Pro Gly Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu
 115 120 125
 Ala Glu Lys Lys Ala Lys Ala Gln Lys Glu Glu Asp Tyr Arg Asn Tyr
 130 135 140
 Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 145 150 155 160
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Lys Glu Ala Asp
 165 170 175
 Glu Ser Arg Asn Glu Gly Thr Ile Asn Gln Ala Lys Ala Lys Val Glu
 180 185 190
 Ser Glu Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg
 195 200 205
 Glu Lys Ala Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln
 210 215 220
 Asp Glu Ser Lys Arg Arg Lys Ser Arg Val Lys Arg Gly Asp Phe Gly
 225 230 235 240
 Glu Pro Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp
 245 250 255
 Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Lys Pro Gly

260					265					270					
Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys
		275					280					285			
Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	His	Arg	Asn	Tyr	Pro	Thr	Ile	Thr
		290					295					300			
Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys
							310					315			320
Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Gly	Ser	Arg	Asn
												330			335
Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	Ser	Lys	Lys	Ala
												340			350
Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu
												355			365
Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys
												370			380
Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu	Lys	Pro
												385			400
Ala	Pro	Ala	Pro	Lys	Pro	Glu	Asn	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu
												405			415
Lys	Pro	Ala	Asp	Gln	Gln	Ala	Glu	Glu							
												420			425

<210> 37
 <211> 439
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 37															
Ala	Ser	Leu	Phe	Leu	Gly	Gly	Val	Val	His	Ala	Glu	Gly	Val	Arg	Ser
1				5					10					15	
Gly	Asn	Asn	Ser	Thr	Val	Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser	Lys	Lys
				20				25					30		
Tyr	Ala	Asp	Glu	Val	Glu	Ser	His	Leu	Gln	Ser	Ile	Leu	Lys	Asp	Val
			35				40					45			
Asn	Lys	Asn	Leu	Lys	Lys	Val	Gln	His	Thr	Gln	Asn	Ala	Asp	Phe	Asn
			50			55					60				
Lys	Lys	Leu	Ser	Lys	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	Leu	Asn	Val
			65		70				75					80	
Leu	Glu	Glu	Lys	Ser	Glu	Ala	Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr
					85			90						95	

Lys Glu Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr Leu
 100 105 110
 Ser Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Lys Lys Lys Val Glu
 115 120 125
 Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg Asn
 130 135 140
 Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser
 145 150 155 160
 Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala
 165 170 175
 Asn Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Lys Val
 180 185 190
 Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp
 195 200 205
 Arg Glu Gln Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg
 210 215 220
 Glu Gln Ala Glu Glu Glu Ala Lys Val Lys Asp Glu Pro Lys Lys Arg
 225 230 235 240
 Thr Lys Arg Gly Val Leu Gly Glu Pro Ala Thr Pro Asp Lys Lys Glu
 245 250 255
 Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro
 260 265 270
 Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys
 275 280 285
 Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg
 290 295 300
 Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala
 305 310 315 320
 Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu
 325 330 335
 Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala
 340 345 350
 Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys
 355 360 365
 Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu
 370 375 380
 Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro
 385 390 395 400

Ala Pro Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Pro
405 410 415

Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro
420 425 430

Ala Asp Gln Gln Ala Glu Glu
435

<210> 38

<211> 460

<212> PRT

<213> Streptococcus pneumoniae

<400> 38

Cys Ile Val Ala Ser Leu Val Met Gly Ser Val Val His Ala Thr Glu
1 5 10 15

Asn Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu
20 25 30

Ser Gln Ala Glu Gln Gly Glu Gln Pro Lys Lys Leu Asp Ser Glu Arg
35 40 45

Asp Lys Ala Arg Lys Glu Val Glu Glu Tyr Val Lys Lys Ile Val Gly
50 55 60

Glu Ser Tyr Ala Lys Ser Thr Lys Lys Arg His Thr Ile Thr Val Ala
65 70 75 80

Leu Val Asn Glu Leu Asn Asn Ile Lys Asn Glu Tyr Leu Asn Lys Ile
85 90 95

Val Glu Ser Thr Ser Glu Ser Gln Leu Gln Ile Leu Met Met Glu Ser
100 105 110

Arg Ser Lys Val Asp Glu Ala Val Ser Lys Phe Glu Lys Asp Ser Ser
115 120 125

Ser Ser Ser Ser Ser Asp Ser Ser Thr Lys Pro Glu Ala Ser Asp Thr
130 135 140

Ala Lys Pro Asn Lys Pro Thr Glu Pro Gly Glu Lys Val Ala Glu Ala
145 150 155 160

Lys Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu
165 170 175

Glu Asp Arg Arg Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu Leu
180 185 190

Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu
195 200 205

Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys Gln
210 215 220

Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu Lys
 225 230 235 240
 Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg Arg
 245 250 255
 Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg Gly
 260 265 270
 Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys
 275 280 285
 Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu
 290 295 300
 Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu Ala
 305 310 315 320
 Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
 325 330 335
 Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val
 340 345 350
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 355 360 365
 Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser
 370 375 380
 Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys
 385 390 395 400
 Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp Lys Val
 405 410 415
 Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Lys Ala
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 Glu Lys Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro
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 Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu
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<210> 39
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 <212> PRT
 <213> Streptococcus pneumoniae

<400> 39
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Glu Gly Ala Thr Gln Val Pro Thr Ser Ser Asn Arg Ala Asn Glu Ser

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Lys	Ala	Arg	Lys	Glu	Val	Glu	Glu	Tyr	Val	Lys	Lys	Ile	Val	Gly	Glu	
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Ser	Tyr	Ala	Lys	Ser	Thr	Lys	Lys	Arg	His	Thr	Ile	Thr	Val	Ala	Leu	
65					70					75					80	
Val	Asn	Glu	Leu	Asn	Asn	Ile	Lys	Asn	Glu	Tyr	Leu	Asn	Lys	Ile	Val	
85					90					95						
Glu	Ser	Thr	Ser	Glu	Ser	Gln	Leu	Gln	Ile	Leu	Met	Met	Glu	Ser	Arg	
100					105					110						
Ser	Lys	Val	Asp	Glu	Ala	Val	Ser	Lys	Phe	Glu	Lys	Asp	Ser	Ser	Ser	
115					120					125						
Ser	Ser	Ser	Ser	Asp	Ser	Ser	Thr	Lys	Pro	Glu	Ala	Ser	Asp	Thr	Ala	
130					135					140						
Lys	Pro	Asn	Lys	Pro	Thr	Glu	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	Lys	
145					150					155					160	
Lys	Lys	Val	Glu	Glu	Val	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	
165					170					175						
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	
180					185					190						
Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	
195					200					205						
Lys	Val	Lys	Ala	Asn	Glu	Pro	Arg	Asp	Lys	Gln	Lys	Ile	Lys	Gln	Ala	
210					215					220						
Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	
225					230					235					240	
Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Arg	Ala	
245					250					255						
Asp	Ala	Lys	Glu	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Pro	Lys	Arg	Gly	Val	
260					265					270						
Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	
275					280					285						
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	
290					295					300						
Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	
305					310					315					320	
Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	

325										330					335				
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu				
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Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro				
		355					360					365							
Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	Ser	Lys				
	370					375					380								
Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys				
385					390					395					400				
Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys				
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Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Lys	Thr	Glu				
			420					425					430						
Lys	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Asn	Pro	Ala	Glu	Gln	Pro	Lys				
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<210> 40

<211> 492

<212> PRT

<213> Artificial Sequence

<220>

<223> consensus sequence for CbpA N-terminal region

<221> VARIANT

<222> 1, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 64, 65, 66, 68, 69, 114, 115, 116, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 173, 174, 175, 176, 177, 178, 179, 262, 275

<223> Xaa = Any Amino Acid or other (i.e., deletion)

<221> VARIANT

<222> 276, 277, 281, 428, 470

<223> Xaa = Any Amino Acid or other (i.e., deletion)

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Asn	Glu	Val	Thr	Thr	Gln	Val	Ala	Thr	Ser	Ser	Asn	Arg	Ala	Asn	Glu				
			20				25				30								
Ser	Gln	Thr	Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Xaa	Xaa	Xaa	Xaa	Xaa				
		35				40					45								
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Val	Asp	Glu	Tyr	Ile	Lys	Lys	Met	Leu	Xaa				
	50				55			60											
Xaa	Xaa	Gln	Xaa	Xaa	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	Ala				
65				70				75							80				

Leu	Asn	Thr	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Glu	Tyr	Leu	Asn	Gly	Leu		
				85					90					95			
Ser	Val	Leu	Glu	Glu	Lys	Ser	Glu	Ala	Glu	Leu	Pro	Ser	Glu	Ile	Lys		
			100					105					110				
Ala	Xaa	Xaa	Xaa	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp		
			115				120					125					
Thr	Leu	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa		
			130				135					140					
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Pro	Thr	Glu	Pro	Gly	Lys	Lys	Val	Ala		
145						150				155					160		
Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Xaa	Xaa	Xaa	Xaa		
				165					170						175		
Xaa	Xaa	Xaa	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro		
			180				185						190				
Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val		
			195				200					205					
Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu		
			210			215					220						
Ser	Arg	Asp	Glu	Gly	Lys	Ile	Asn	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser		
225					230					235					240		
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu		
				245					250					255			
Lys	Ala	Glu	Glu	Glu	Xaa	Ala	Lys	Arg	Arg	Ala	Asp	Ala	Lys	Leu	Gln		
			260				265						270				
Glu	Ala	Xaa	Xaa	Xaa	Asn	Val	Ala	Xaa	Ser	Glu	Gln	Asp	Lys	Pro	Lys		
			275				280					285					
Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys		
			290			295					300						
Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr		
305					310					315					320		
Leu	Pro	Ser	Pro	Ser	Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu		
				325					330					335			
Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu		
			340				345						350				
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu		
			355				360					365					
Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val		
			370			375					380						
Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala		
385					390					395					400		
Lys	Ala	Glu	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys		
				405					410					415			
Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Xaa	Ala	Lys	Arg	Lys		
			420				425						430				
Ala	Ala	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln			
			435			440					445						
Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu	Lys	Pro	Ala	Glu	Pro	Glu	Asn			
						455					460						
Pro	Ala	Pro	Ala	Pro	Xaa	Pro	Lys	Pro	Glu	Asn	Pro	Ala	Glu	Gln	Pro		
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Lys	Ala	Glu	Lys	Pro	Ala	Asp	Gln	Gln	Ala	Glu	Glu						
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<223> Oligonucleotide primer

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23

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<220>
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33